WIPER SYSTEM DRIVE

Prior Art

The invention is based on a wiper system drive as generically defined by the preamble to claim 1.

Wiper systems with multiple windshield wipers for motor vehicles are fastened by their wiper bearings directly or indirectly via a mounting plate to the vehicle body. The mounting plate or a tubular mounting plate - if the wiper carrier also includes tubular hollow profiles - includes a motor mounting plate, which carries a wiper drive with a wiper motor and a gear mounted thereon. A power takeoff shaft of the gear is supported in a gear dome and, as a rule via a crank and joint rods, drives further cranks, which are solidly connected to a drive shaft for each windshield wiper.

It is also possible for the power takeoff shaft of the wiper motor to drive a four-bar lever mechanism. This mechanism has a drive lever, which is seated pivotably on a drive axis and is connected in articulated fashion to a guide rod lever via a coupling rod. This lever is pivotably supported on a stationary shaft. A fastening part of a wiper arm is formed integrally onto the coupling rod and with it forms a so-called four-bar wiper lever, to which the joint part of the wiper arm is fastened via a foldaway joint. The drive lever can be driven directly from a power takeoff shaft of the wiper motor or via a crank and joint rods. It can also be embodied as a cross lever. The kinematics of the four-bar lever mechanism effect a combined reciprocating and swiveling motion of the

windshield wiper. As a result, the windshield wiper is better able to follow the angular contour of a vehicle window. If two synchronized windshield wipers are provided, then as a rule only one is driven via a four-bar lever mechanism, while the other is connected to a driven element, via a joint rod and a crank.

So that the forces on the joint rods will be slight, the crank has a relatively great length. This means a long radius of the crank path, which together with the typically low ratio of the crank radius to the rod length of approximately 1/4 to 1/7 demands a correspondingly large structural volume and associated room to move for the wiper linkage. Furthermore, it leads to an inharmonious course of motion. Wiper drives with reversible wiper motors are also known, in which the crank on the power takeoff shaft of the wiper motor executes a virtually semicircular pivoting motion. This drive requires markedly less room to move for the crank on the wiper motor.

In the known drives, the position of the wiper motor determines the location and geometry of the drive curve for the joint rods. Since the wiper motor and the lever mechanism cannot be positioned arbitrarily however, because the space in the vehicle is limited and is used for other equipment, the result is often unfavorable kinematics, which leads to an unfavorable course of speed and acceleration for the lever mechanism and as a rule requires a large amount of room to move. The result is compromises, which adversely affect the quality and reliability of the wiper system.

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wiper drive is known that comprises a wiper motor and a lever mechanism. An offset-bent drive crank is seated on the power takeoff shaft of the wiper motor. A joint rod, which is pivotably connected to the drive crank via a ball joint, is also pivotably connected by its free end, again via a ball joint, to a crank embodied as a crank plate, which is fastened to a drive shaft of a windshield wiper. Via a further ball joint, the crank plate is engaged by a second joint rod, which with its free end is pivotably connected to a crank that is fastened to a drive shaft for a second windshield wiper. The lever mechanism comprising cranks and joint rods is very complicated and requires a great amount of room to move.

Advantages of the Invention

According to the invention, a coupling rod which is pivotably connected to a guide rod pivotably supported on a vehicle body is connected in articulated fashion to the crank; the thus-formed coupling gear is connected to the drive lever via the joint rod. The coupling gear, which in particular requires only little, compact room for motion, if a reversible wiper motor is used, offers many opportunities for pivotably connecting the joint rods and driving them. Thus the kinematics of the wiper drive can be varied such that by the selected articulated connection of the joint rods to the coupling gear, an unfavorable position of the wiper motor can be compensated for. As a result, the position of the wiper motor can be selected freely in accordance with the space available in the vehicle, without having to accept the above-described disadvantages into the bargain.

The coupling rod can be a simple sheet-metal part, which on each of its ends has a joint pin that is adjoined by the guide rod and the crank, respectively, via a bearing shell. The joint pins can be fastened unilaterally to the coupling rod. To avoid bending forces at the attachment points between the joint pins and the coupling rod, it is expedient that the coupling rod have two sheet-metal parts, between which it retains at least one joint pin on its face ends. Because of the two-sided fastening of the joint pins and the bearing of the crank or guide rod between the fastening points, the bending forces are very slight.

If the crank, coupling rod and guide rod are located in the same plane, the joint pins can be embodied cylindrically. If not, ball joints can be provided instead. If the joint pins are fastened to the coupling rod on both of their face ends, then the coupling rod has a considerable height in the region of the joints. It is therefore advantageous to design the coupling rod in forked fashion on its ends, and it retains the joint pin in the fork. As a result, it can assume an arbitrary height between the joints, so that in the case of a shallow design of the coupling rod, freedom of motion for the levers and articulation points is assured. This kind of design is suitable both for die-cast coupling rods and for coupling rods made of sheet-metal parts.

If the coupling rod has two sheet-metal parts, then the sheet-metal parts are expediently tacked together locally between the joint pins. One sheet-metal part can be curved toward the other, so that because of the offset bending of the sheet-metal part in

the longitudinal direction of the coupling rod, free room to move is obtained for further drive parts. The coupling rod can also have offset bends transversely to the direction of motion, which assure freedom of motion for other drive parts.

The joint rods can be pivotably connected at various points of the coupling gear. This purpose is served by ball pegs, which are disposed for instance on the crank of the wiper motor, on the guide rod, on the coupling rod between the joints, or at the joint pins. If the ball pegs are disposed on the crank of the wiper motor or on the coupling rod or on the guide rod, then typically they are secured by wobble riveting. If the coupling rod is locally tacked together between the joint pins, this can also be done by means of a ball peg which joins the two sheet-metal parts to one another in this region by wobble riveting.

A plurality of windshield wipers, as a rule two, can be driven via the coupling gear. In that case, many ball pegs should be provided, which can also be embodied as double-ball pegs.

Drawing

Further advantages will become apparent from the ensuing description of the drawing. In the drawing, exemplary embodiments of the invention are shown. The drawing, description and claims include numerous characteristics in combination. One skilled in the art will expediently consider the characteristics individually as well and put them together to make useful further combinations.

Shown are:

Fig. 1, a schematic illustration of a wiper system;

Fig. 2, a schematic illustration of a wiper motor with a coupling gear and various motion curves;

Fig. 3, a perspective view of a coupling gear according to the invention;

Fig. 4, a side view of a bearing point of the coupling rod in section;

Figs. 5-6, variants of Fig. 4;

Fig. 7, a longitudinal section through a coupling rod; and

Figs. 8-10, variants of Fig. 7.

Description of the Exemplary Embodiments

The wiper system 10 has two windshield wipers 12 and 14. The windshield wiper 14 is driven by a wiper motor 18 via a coupling gear 20 and a joint rod 30. The joint rod is connected in articulated fashion to a crank 32, which drives a drive shaft 34 on which the windshield wiper 14 is seated. Upon actuation, the windshield wiper executes a simple swiveling motion about the drive shaft 34.

The coupling gear 20 includes a crank 22, a further coupling rod 24 pivotably connected to the crank

via a joint 50, and a guide rod 26, which is connected on one end via a joint 54 to the coupling rod 24 and by its other end is pivotably supported at a bearing point 48 on the vehicle, or on a mounting plate 42 solidly connected to the vehicle. The crank 22 is driven by the wiper motor 18, which is a reversing motor, and the joint 50 between the crank 22 and the coupling rod 24 describes a motion curve 56.

The wiper 12 is fastened to a four-bar wiper lever 40, which is pivotably connected to a guide rod 38 and to a drive lever in the form of a cross guide rod 36. The guide rod 38 and the cross guide rod 36 are pivotably supported in respective bearing points 44 and 46 on the mounting plate 42. Because of the four-bar wiper lever 40, the windshield wiper 12 executes a reciprocating and swiveling motion and creates a swept field 16 that conforms well to an angular contour of a windshield well.

The cross guide rod 46 is driven by a joint rod 28, which is pivotably connected at a joint 52 having a ball peg 80 between the joints 50 and 54 of the coupling rod 24. During the actuation of the wiper motor 18, the joint 52 describes a motion curve 60 with a very shallow course, so that the joint rod 28 essentially executes a reciprocating motion and thus needs only very little room to move, and this amount of room varies hardly at all if the spacing between the wiper motor 18 and the drive lever 36 varies. Fig. 2, on a larger scale, shows the motion curves 56 of the joint 50 and of the joint 52. Alternative motion curves 62 for an articulation point 68 and a motion curve 64 for an articulation point 66 are also shown. The motion curve 58 illustrates the

swiveling motion of the guide rod 26 about the bearing point 48 and thus the end of the joint rod 30 for the actuation of the windshield wiper 14.

Depending on the disposition of the wipers 12 and 14 and on the position of the wiper motor 18, the joint rods 28, 30 can be articulated at suitable articulation points of the coupling gear 20.

The version of the coupling gear 20 in Fig. 3 has a crank 22 with an offset bend 74 in the direction of motion. Upon a swiveling motion in the direction of the arrow 86, this enables freedom from collision with a ball peg 82 on the coupling rod 24. The coupling rod 24 in turn also has offset bends 76 and 78, which assure freedom from collision with other drive parts.

The version of Fig. 4 has a joint pin 84 with a formed- on ball peg 80. The joint pin 84 is connected to a coupling rod 24, which comprises two sheet-metal parts 70 and 72, the joint pin being riveted to the sheet-metal part 72, while the other sheet-metal part 70 is retained between a bearing shell 88 and the ball peg 80. The bearing shell 88 is solidly connected to the crank 22, preferably being cast integral as a plastic part. The version of Fig. 5 differs from the version of Fig. 4 in that the joint pin 84 is unilaterally connected to a coupling rod, which comprises a single sheet- metal part 96 or a corresponding die-cast part. In the version of Fig. 6, a joint pin 90 is riveted unilaterally to the crank 22. Between the crank 22 and a collar of the joint pin 90, the bearing shell 88 is provided, which is solidly connected to the coupling rod 24.

In the versions of Figs. 7-10, the coupling rod 24 comprises two sheet-metal parts 70 and 72, which are forklike on their ends, being tacked together in a middle region. In the forks on their ends, the sheet-metal parts 70, 72 retain joint pins 84 with bearing shells 88, to which the crank 22 and the guide rod 26, respectively, are fastened.

In the version of Fig. 7, one ball peg 80 is secured to the crank 22, while a further ball peg 82 is disposed on the coupling rod 24 between the joint pins 84. The sheet-metal parts 70 and 72 are tacked together by the ball peg 82, and the sheet-metal part 72 is curved toward the sheet-metal part 70 and forms an offset bend 92, to assure freedom from collision with other drive parts.

In a distinction from the version of Fig. 7, the ball peg 80 in Fig. 8 is integrally embodied with the joint pin 84. Fig. 9 shows a version in which a double-ball peg 94 suitably replaces the ball peg 82 of the versions in Figs. 7 and 8. Finally, in the version of Fig. 10, the ball pegs 80 and 82 are disposed side by side on the coupling part 24 between the joint pins 84. By means of them, the sheet-metal parts 70 and 72 are joined together in the same way as in the versions of Figs. 7-9. As a result, there are numerous possible ways of varying the locations and designs of the articulation points of the joint rods 28, 30.